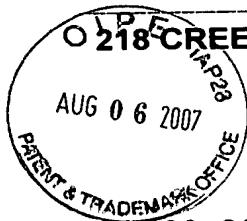


# DR. MICHAEL Y. LIANG

IFW



July 30, 2007

TO: Mr. Monzer R. Chorbaji  
United States Patent and Trademark Office  
Commissioner For Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
Fax: (571) 273-8300

Ref: Application no: 10/707,919; Art Unit: 1744; Filing date: 01/26/2004

Dear Sir:

In response to your Office Action Summary received recently (June 2007), I make some corrections to my application as follows:

- 1, in claim 1, line 4: "to remove large particles" should be "to remove large particles (1um to 10um);"
- 2, claim 1 (b), line 6-9 should be: "using circuitous sterilizing chamber(s) interiorly partitioned into roundabout channel(s), or spiral channel(s), or zigzag channel(s) to contain said fluent material;"

I also make some other corrections as follows:

- 1, in background of invention, line 3: "which uses intense ultraviolet (UV)" should be "which uses intense 253.7nm wavelength ultraviolet (UV)";
- 2, in summary of invention, line 2: "in large volumes" should be "in large volumes (300 to 30000 cfm)";
- 3, in detailed description, paragraph [0044], line 7: "any fairly large particles" should be "any fairly large particles (1 um to 10um)";
- 4, in detailed description, paragraph [0046], line 9: "The length and/or the number of roundabouts of the chamber 10" should be "The length of the channel(s) and/or the number of roundabouts in the chamber 10";
- 5, claim 3 should be: "The apparatus of claim 2 wherein said circuitous sterilizing chamber 10 is interiorly partitioned into roundabout channel(s), or spiral channel(s), or zigzag channel(s) for the purpose of increasing UV exposure."

# DR. MICHAEL Y. LIANG

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218 CREEDON CIRCLE, ALAMEDA, CA 94502, USA. TEL/FAX: (510) 769-8394  
Email: [ml\\_sps2@yahoo.com](mailto:ml_sps2@yahoo.com); [ml\\_amecx@yahoo.com](mailto:ml_amecx@yahoo.com)

As to your rejection to my claim 1 under 35 U.S.C. 102(b) as being anticipated by Hirai et al (U.S.P.N. 4990311), I have objections to your action because you were comparing apple and tomato and over interpreted Hirai's method.

First, Hirai and I use different theories to reach different goals. Hirai's UV ray is not my UV ray.

My invention use radiation theory to kill microorganisms in air directly. It employs only one kind of UV ray at about 253.7nm wavelength (my application, summary of invention, paragraph [0013]) known as the best UV ray for killing microorganisms by irradiation in all UV rays to kill all microorganisms.

However, Hirai's method uses ozone theory to deodorize air. It employs UV ray at about 185 nm wavelength (Hirai's patent, Background of the Invention, line 5 and Description of the Preferred Embodiments, column 3, line 14) known as the best UV ray for producing ozone to deodorize air. Ozone is good for deodorization, but it has weaker killing power to microorganisms than 253.7nm UV radiation.

You may argue that, the second UV light (Hirai's patent, figure 5:32), in Hirai's method, with wavelength at about 254nm also has the function to kill microorganisms by radiation. However, the second UV light has limitation to its intensity because it was only designed to reenergized catalyst filter and includes means to control it (Hirai's patent, Background of the Invention, line 5 and Description of the Preferred Embodiments, column 3, line 18). Thus it has even weaker irradiating killing power to microorganisms than normal 253.7nm UV light applications like other patents cited in my application.

Second, the circuitous sterilizing chamber in my invention is interiorly of a different shape to the one in Hirai's method.

Hirai's method uses rectangle chamber (which should not be considered as circuitous chamber, Hirai's patent, figure 5:73) to contain the fluent material. When the fluent material goes through the chamber 73, each portion of the said material will actually travels different distance in the chamber before discharging through a connecting duct (Hirai's patent, figure 5:85), where no any UV light at all, into second rectangle chamber (figure 5:74) for decomposing ozone. With Hirai's method, only a portion of the said material

# DR. MICHAEL Y. LIANG

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218 CREEDON CIRCLE, ALAMEDA, CA 94502, USA. TEL/FAX: (510) 769-8394  
Email: [ml\\_sps2@yahoo.com](mailto:ml_sps2@yahoo.com); [ml\\_amecx@yahoo.com](mailto:ml_amecx@yahoo.com)

like you described “flowing in the upper part of diffuser plate 41 in chamber 71 then the gas flows downward through connecting duct 81 ...” The other will flow in the lower part of diffuser plate 41 in chamber 71 then toward connecting duct 81... So, each portion of the said material does not travel equally in time and in distance, which results in the uneven exposure to the UV radiation. Then, the effect of sterilization can not be guaranteed.

My invention employs chamber(s) interiorly partitioned into continually circuitous channel(s) by interior wall (my application figure 1 to 5:9) to contain the fluent material. The circuitous channel(s) in my method not only guarantee all fluent material will synchronously go through the sterilizing chamber with similar length, but also guarantees all fluent material equally exposed to designated amount of UV radiation.

Third, in my invention, the interior circuitous channel(s) of the chamber offers a flexible infrastructure for installing designated number of UV lamps. The length of the channel(s) and/or the number of roundabouts in the chamber can be changed to accomplish the sterilization target. In the preferred embodiment of my invention (figure 2), ninety-eight UV lamps are employed offering at least 1500W 253.7nm UV power to sterilizing air. However, Hiral’s method does not have such infrastructure and only employs one 254nm UV lamp.

Fourth, in my application, “in large volume” means 300 cfm to 30000 cfm. The average travel time for the fluent material within the chamber is less than two seconds. But with Hiral’s method, it only deal with very little amount of fluent material (0.07cfm) [2 liters/min, Hiral’s patent, column 4, Experimental Examples, line 23]. According to common practice, if using ozone to sterilizing air, it needs ozone concentration in the air higher than 20mg/cbm and lasts at least thirty minute to reach 90% killing rate. So, it is not true to interpret that Hiral’s method can sterilize air in large volume.

Fifth, in my invention, since non-ozone germicidal lamps are used (my application, Detailed Description, paragraph [0047], line 9) as the source of 253.7 nm UV ray, there should be no ozone generated theoretically. The comprised catalytic ozone filter in the outlet filter is just for the trace amount of ozone generated by application using some low-end lamps. It does not play an important role in my invention and it is usually omitted in actual applications.

# DR. MICHAEL Y. LIANG

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**218 CREEDON CIRCLE, ALAMEDA, CA 94502, USA. TEL/FAX: (510) 769-8394**  
**Email: ml\_sps2@yahoo.com; ml\_amecx@yahoo.com**

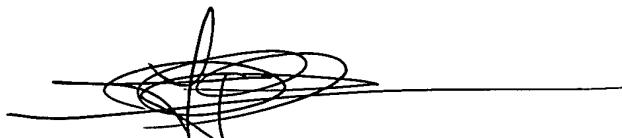
On the opposite, in Hiral's method, the catalytic filter is the key component as there is plenty of ozone generated on purpose in the first chamber.

In conclusion, the differences in theory, wavelength of UV ray, interior shape of the chamber, UV intenseness, air volume deal with and the purpose of the inventions make my invention distinct from Hiral's method. In all these crucial fields, my invention is totally different from Hiral's method. There would not be any scientific evidence to show Hiral's method can be used to sterilizing air in large volume and as efficient as my invention. Thus, Hiral's patent does not have any inherent feature which covers my invention not be recognized at the time of his invention. And MPEP 2112, II should not be applied.

I believe that the above corrections will make my idea more clear and my explanation will help you understand the difference between my invention and U.S.P.N. 4990311.

If there is any thing I have to do, please let me know.

Yours truly,

A handwritten signature in black ink, appearing to read "Michael Liang", is written over a horizontal line. The signature is somewhat stylized and includes a small circle at the top.

Michael Liang

# DR. MICHAEL Y. LIANG

218 CREEDON CIRCLE, ALAMEDA, CA 94502, USA. TEL/FAX: (510) 769-8394  
Email: ml\_sps2@yahoo.com; ml\_amecx@yahoo.com



July 30, 2007

TO: GLADYS J. CORCORAN  
United States Patent and Trademark Office  
Commissioner For Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
Fax: (571) 273-8300

Ref: Application no: 10/707,919; Art Unit: 1744; Filing date: 01/26/2004

Dear Gladys Corcoran:

I need your attention to my application because Mr. Chorbaji over interpreted USPN4990311 when he compared my application with it.

Hereafter is a copy of my response to Mr. Chorbaji's Action Summary as well as two copy of figures. One is from USPN4990311 and the other from my application.

If there is any thing I have to do, please let me know.

Yours truly,

Michael Liang



US 20050163648A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2005/0163648 A1  
(43) Pub. Date: Jul. 28, 2005

(54) METHOD AND APPARATUS FOR  
STERILIZING AIR IN LARGE VOLUMES BY  
RADIATION OF ULTRAVIOLET RAYS

(76) Inventor: MICHAEL Y. LIANG, ALAMEDA,  
CA (US)

Correspondence Address:  
MICHAEL Y. LIANG  
218 CREEDON CIRCLE  
ALAMEDA, CA 94502 (US)

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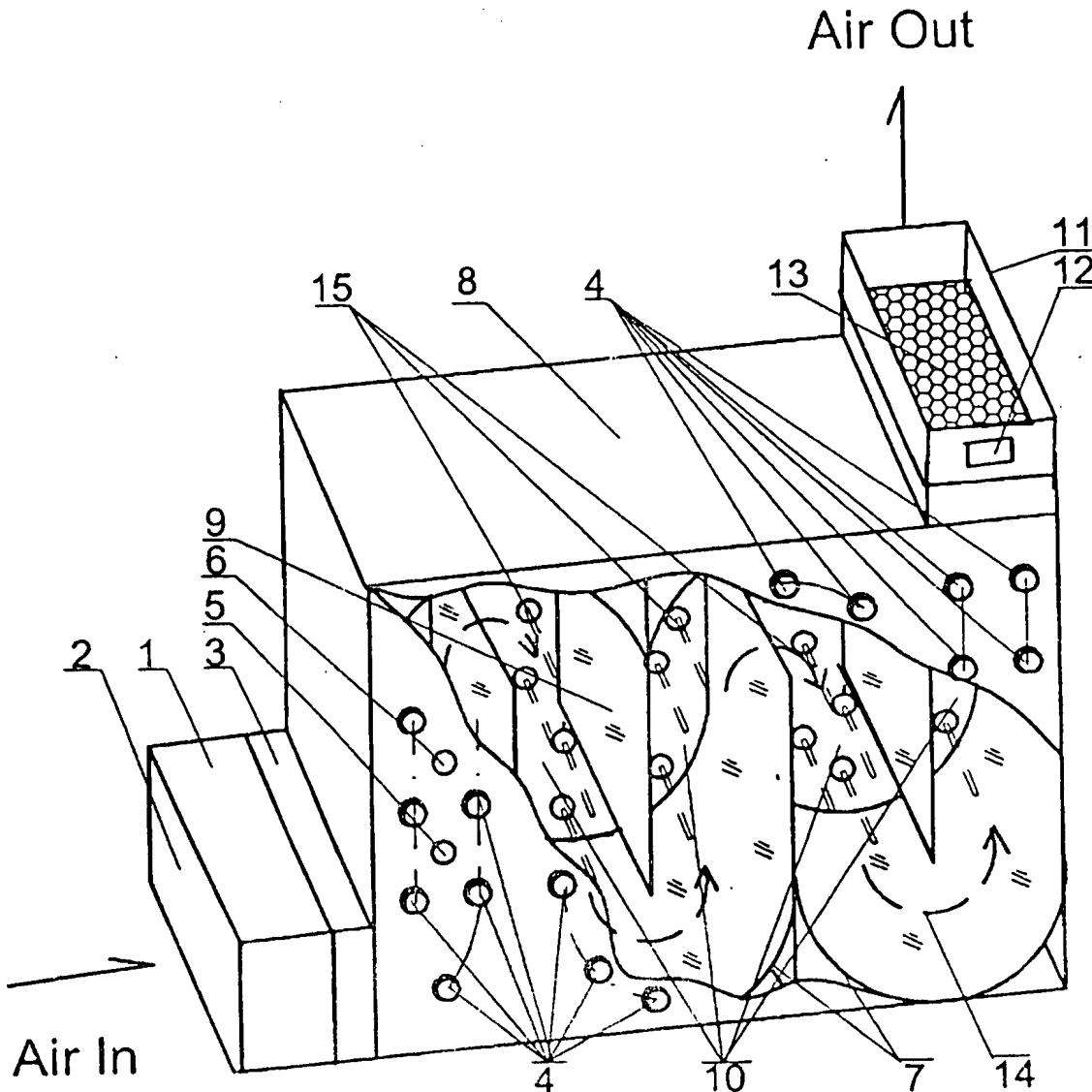
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422/305

ABSTRACT

A sterilizing method and apparatus for destroying live microorganisms including viruses in fluent material, such as air and water, in large volume. As a preferred embodiment of this invention, air is drawn, from the inlet 1, through the inlet filter unit 3 and into the circuitous sterilizing chamber 10 that is irradiated by numbers of UV lamp tubes 15, and through the discharging filter unit 13 and then out through outlet 11. A sample window 12 is built in for quality supervision. Visual inspection windows 5 and UV sensors 6 are provided for easy supervision and auto-control. The sterilizing chamber 10 also includes flow resistant reducing feature 7 and internal reflecting surfaces 9.





U.S. Patent

Feb. 5, 1991

Sheet 3 of 4

4,990,311

FIG. 5

